

WHAT IS CLAIMED IS:

1. A method for determining the translational efficiency of an individual codon in a cell of a predetermined type, said method comprising:

5 - introducing into a first cell of said predetermined type a synthetic construct comprising a reporter polynucleotide fused in frame with a tandem repeat of said individual codon, wherein said reporter polynucleotide encodes a reporter protein, and wherein said synthetic construct is operably linked to a regulatory polynucleotide; and

10 - measuring expression of said reporter protein in said cell of said predetermined type to determine the translational efficiency of said codon.

2. The method of claim 1, further comprising comparing:

15 - expression of said reporter protein in said first cell to which a synthetic construct comprising a tandem repeat of said individual codon was provided; and

20 - expression of said reporter protein in a second cell of the same type as said first cell to which a synthetic construct comprising a tandem repeat of another individual codon was provided;

to thereby determine the relative translational efficiency of said individual codons in said cell of said predetermined type.

3. The method of claim 1, further comprising comparing:

25 - expression of said reporter protein in said first cell to which a synthetic construct comprising a tandem repeat of said individual codon was provided; and

30 - expression of said reporter protein in another cell of a different predetermined type than said first cell to which a synthetic construct comprising a tandem repeat of said individual codon was provided;

to thereby determine the translational efficiency of said individual codon in said first cell relative to said other cell.

4. The method of claim 1, further comprising:

- introducing the synthetic construct into a progenitor cell of said cell of said predetermined type; and

- producing said cell of said predetermined type from said progenitor cell;

wherein said cell of said predetermined type contains said synthetic construct.

5. The method of claim 1, further comprising

- introducing the synthetic construct into a progenitor of said cell; and

- growing an organism or part thereof from said progenitor cell;

wherein said organism or part thereof comprises said cell containing said synthetic construct.

6. The method of claim 1, further comprising

- introducing the synthetic construct into an organism or part thereof such that said synthetic construct is introduced into said cell of said predetermined type.

7. A synthetic construct comprising a reporter polynucleotide fused in frame with a tandem repeat of individual codons, wherein said reporter polynucleotide encodes a reporter protein, and wherein said synthetic construct is operably linked to a regulatory polynucleotide.

8. A vector comprising the synthetic construct of claim 7.

9. A cell comprising the synthetic construct of claim 7.

10. A cell comprising the vector of claim 9.

11. A method of constructing a synthetic polynucleotide from which a protein is selectively expressed in a target cell of an

organism, relative to another cell of the organism, said method comprising:

5 - selecting a first codon of a parent polynucleotide for replacement with a synonymous codon which has a higher translational efficiency in said target cell than in said other cell; and

 - replacing said first codon with said synonymous codon to form said synthetic polynucleotide, wherein said first codon and said synonymous codon are selected by:

10 - comparing translational efficiencies of individual codons in said target cell relative to said other cell; and

15 - selecting said first codon and said synonymous codon based on said comparison, wherein said comparison comprises:

20 - introducing into said target cell and said other cell a synthetic construct comprising a reporter polynucleotide fused in frame with a tandem repeat of an individual codon, wherein said reporter polynucleotide encodes a reporter protein, and wherein said synthetic construct is operably linked to a regulatory polynucleotide; and

 - comparing expression of said reporter protein in said target cell relative to said other cell;

25 to thereby determine the translational efficiency of individual codons in said target cell relative to said other cell.

12. The method of claim 11, wherein said synonymous codon corresponds to a reporter construct from which the reporter protein is expressed in said target cell at a level that is at
30 least 110% of that expressed from the said reporter construct in said other cell.

13. A method of constructing a synthetic polynucleotide from which a protein is expressible in a target cell of an organism at a higher level than from a parent polynucleotide expressing said protein, said method comprising:

5 - selecting a first codon of the parent polynucleotide for replacement with a synonymous codon which has a higher translational efficiency in said target cell than said first codon;

10 - replacing said first codon with said synonymous codon to form said synthetic polynucleotide, wherein said first codon and said synonymous codon are selected by:

 - comparing translational efficiencies of different individual codons in said target cell; and

15 - selecting said first codon and said synonymous codon based on said comparison wherein said comparison comprises:

20 - introducing into a target cell a synthetic construct comprising a reporter polynucleotide fused in frame with a tandem repeat of an individual codon, wherein said reporter polynucleotide encodes a reporter protein, and wherein said synthetic construct is operably linked to a regulatory polynucleotide;

25 - introducing into a target cell a different synthetic construct comprising the reporter polynucleotide fused in frame with a tandem repeat of another individual codon; and

 - comparing expression of said reporter protein from each synthetic construct in said target cell;

30 to thereby determine the translational efficiency of individual codons in said target cell.

14. The method of claim 13, wherein said synonymous codon corresponds to a reporter construct from which the reporter protein is expressed in said target cell at a level that is at least 110% of that expressed from the different reporter construct corresponding to said first codon.

15. A synthetic polynucleotide constructed according to the method of claim 11.

16. A vector comprising the synthetic polynucleotide of claim 15.

17. A cell comprising the synthetic polynucleotide of claim 15.

18. A cell comprising the vector of claim 16.

19. A synthetic polynucleotide constructed according to the method of claim 13.

20. A vector comprising the synthetic polynucleotide of claim 19.

21. A cell comprising the synthetic polynucleotide of claim 19.

22. A cell comprising the vector of claim 20.